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**Original**

# Changes in Pediatric Patient Trends in Eating and Swallowing Disorders : A Comparison between the First and Fifth Year after Establishment of the Special Needs Dental Center

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**Abstract** : A Special Needs Dental Center (hereafter referred to as the Center) was established at Showa University Dental Hospital in April 2012 to treat patients who need special care. In cooperation with the Division of Dentistry for Persons with Disabilities, the Division of Hygiene and Oral Health is mainly engaged in the treatment of patients with eating and swallowing disorders. It has been five years since the establishment of the Center. The present study was aimed to establish an effective medical support method through a comparative study of changes in patient trends. A total of 65 patients who visited the Center from April 2017 to March 2018 were examined and their statistics were compared with those of 60 previously reported patients who initially visited the Center for medical examination in 2012. In 2012, many visits occurred during the nursing period; however, in 2017, the number of patients who visited after the weaning period increased. Other noted trends were increased diversity in primary disease, more patient referrals, fewer patients with severe swallowing dysfunction, and more patients with oral dysfunction. The necessity of eating and swallowing practice is thought to increase when lifestyle and oral environment change. The treatment of eating and swallowing disorders is important in the dental profession. Due to the introduction of insurance coverage in Japan in 2018 for developmental insufficiency of oral function, more pediatric patients with eating and swallowing disorders will likely be treated in the future.

**Key words** : clinical statistics, eating and swallowing disorders, pediatric patients, special needs dentistry

## Introduction

The main requirements for the treatment of eating and swallowing disorders in pediatric patients are early intervention, response to life changes, and multi-disciplinary cooperation. In

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addition, there is a need to respond to dietary problems in children, regardless of their disability status.

According to a 2018 report by the Cabinet Office, Government of Japan, the total number of physically- and mentally-handicapped children under the age of 18 in Japan is approximately 292,000, and the total number over the age of 18 is approximately 5,036,000. This number is increasing annually[1, 2]. The Center for Special Needs Dentistry (referred to hereafter as the Center) was established in April 2012 at Showa University Dental Hospital to provide medical care to patients with special needs, including those with disabilities. Currently, in cooperation with the Division of Dentistry for Persons with Disabilities in the Center, the Division of Hygiene and Oral Health conducts treatment in pediatric patients with eating and swallowing disorders. Cerebral palsy, intellectually disability, and many other syndromes are often seen as eating and swallowing disorders[3]. Patients with these disabilities and many patients in need of treatment for eating and swallowing visit the Center.

To explore more efficient and specialized medical support methods for the increasing number of patients, we compared the trends between new patients who visited the Center for eating and swallowing disorders in the first year and fifth year after its establishment.

## Materials and methods

The total number of outpatients with eating and swallowing disorders who visited the Center over a one-year period (April 2017–March 2018) was determined. The following information was collected from the medical records of new patients aged ≤ 18 years visiting the Center during this one-year period: age, geographic origin, referring facility, primary disease, reason for visiting the Center, method of nutritional intake, and eating and swallowing function. The results of these statistics were compared with those from patients examined between April 2012 and March 2013[4]. Experimental protocols were approved by the Showa University Dental Hospital Institutional Review Board (Permission Number: DH2018-028). Age was evaluated, including the average value and gender ratio. Geographic origins were evaluated, such that the Johnan area of Tokyo (Shinagawa City, Ota City, Meguro City and Setagaya City) in which the Showa University Dental Hospital is located was classified as one area, and the others were classified by prefecture.

The referral facility was evaluated such that the classification of University Hospital included Showa University and other university hospitals. Hospitals that are not university hospitals were classified as medical hospitals. To avoid duplications, the reason for visiting the Center was taken as that which the patient considered most important in the list of classifications. The primary disease was considered as the disease that had the most influence on the cause of the eating and swallowing disorder and the reason for visiting the Center. For example, if a cleft palate was alone, it was classified as the primary disease. However, if it was part of a syndrome, it was classified as the name of the syndrome.

The method of nutrient intake was chosen from the following five options: only oral intake, oral intake plus nasogastric tube feeding, oral intake plus gastrostoma, only nasogastric tube

feeding, and only gastrostoma. The eating and swallowing function was classified based on the five terms of swallowing, according to the doctor's evaluation at the first visit: anticipatory stage (problems with preparing to eat), oral preparatory stage and oral propulsive stage (oral functional problem), and pharyngeal stage and esophageal stage (swallowing functional problem)[5].

## Results

*Number of patients*

The number of patients visiting the Center was 853 in 2012 (first visit, 60; follow-up visit, 793), and 948 in 2017 (first visit, 65; follow-up visit, 883); thus, the total number of visits increased. New patient visits increased slightly from 60 to 65, but most of the increase was due to the re-examination of patients. March was the month with the highest number of patient visits at the Center, while the number of new patients visiting the Center remained approximately the same every month (Fig. 1).

*Patient age*

The mean (standard deviation) age of the patients was 4.2 (4.1) years in 2012 and 4.5 (3.9) in 2017. There was no significant difference in the number of males and females. The proportion of 0-year-olds decreased from 20% to 13% overall, while that of 1-year-olds increased from 12% to 18%. Patients aged 2–5 years remained at 40%, those aged 6–7 years increased slightly from 13% to 15%, and 12-18-year-olds increased from 1.7% to 6.2% (Fig. 2).

*Geographic origins*

In both 2012 and 2017, most patients were from one of the four cities in the Johnan area of Tokyo (Shinagawa City, Meguro City, Ota City, and Setagaya City). Visits from Tokyo and the

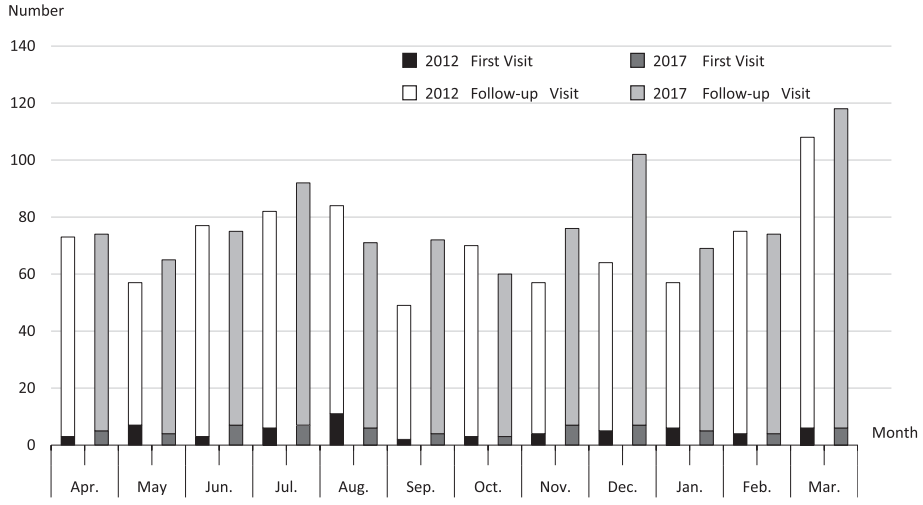


Fig. 1. Number of patients per month
Number of patients visiting the Center of Special Needs Dentistry each month between April 2012 and March 2013, or between April 2017 and March 2018.

neighboring Kanagawa prefecture accounted for 78% in 2012 and 89% in 2017 (Fig. 3).

*Referral facilities*

Overall referrals were significantly increased. Additionally, referrals by hospitals, including the related hospitals of Showa University, were markedly increased (Fig. 4).

*Reason for visiting the Center*

Patients who required diagnosis of eating problems accounted for the majority of patients in both 2012 and 2017. The number of patients who wanted a Hotz plate decreased [4, 6]. By contrast, patients with worries regarding an unbalanced diet and weaning food increased (Fig. 5).

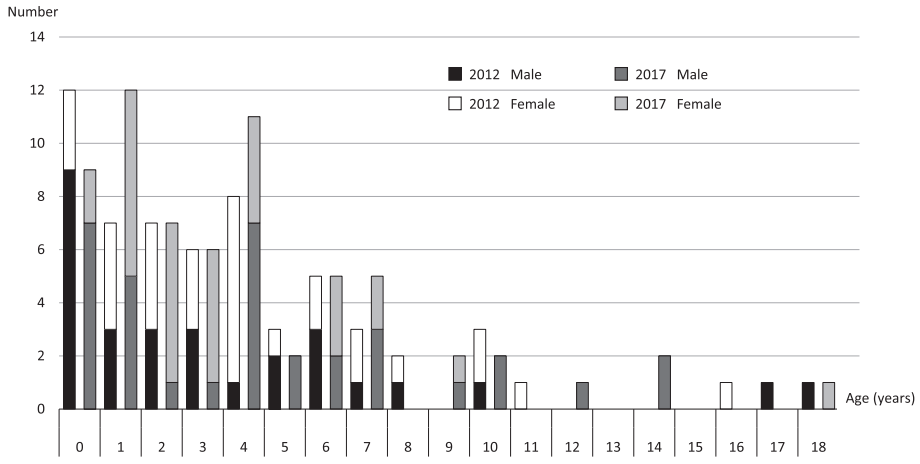


Fig. 2. Patient age
Age distribution of patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018.

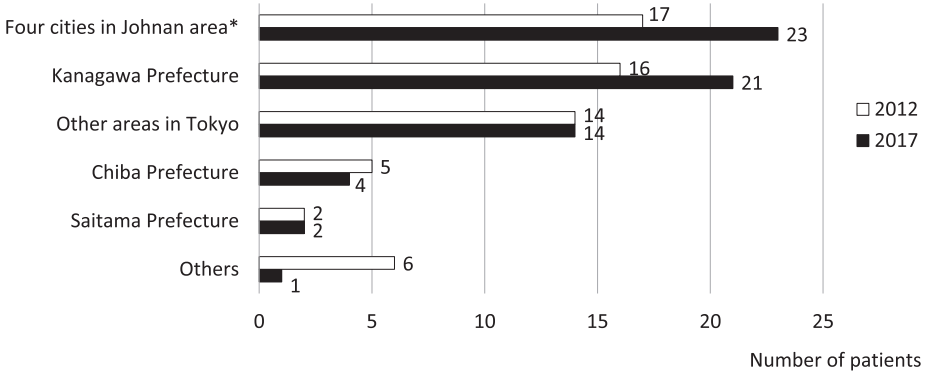


Fig. 3. Geographic origin of patients
Geographic origin of patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018.
*The four cities in the Johnan area of Tokyo are Shinagawa City, Ota City, Meguro City, and Setagaya City.

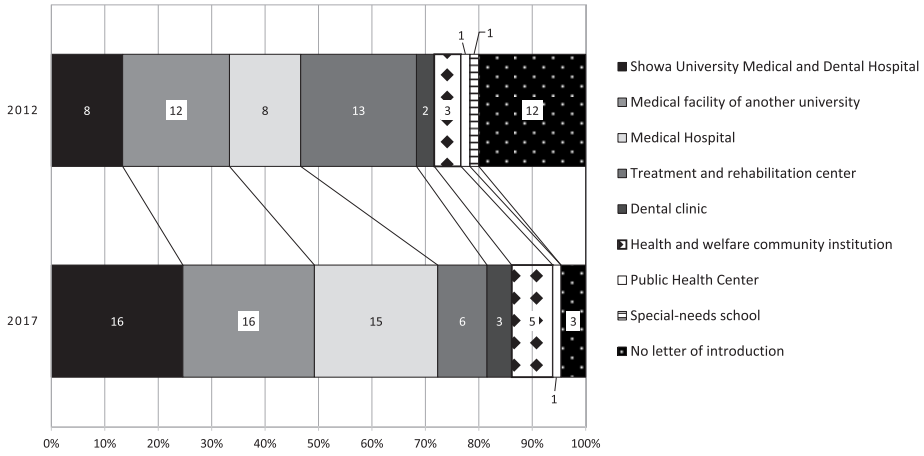


Fig. 4. Referral facilities

Referral facilities for patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018. Referrals by hospitals, including the related Hospital of Showa University, were markedly increased.

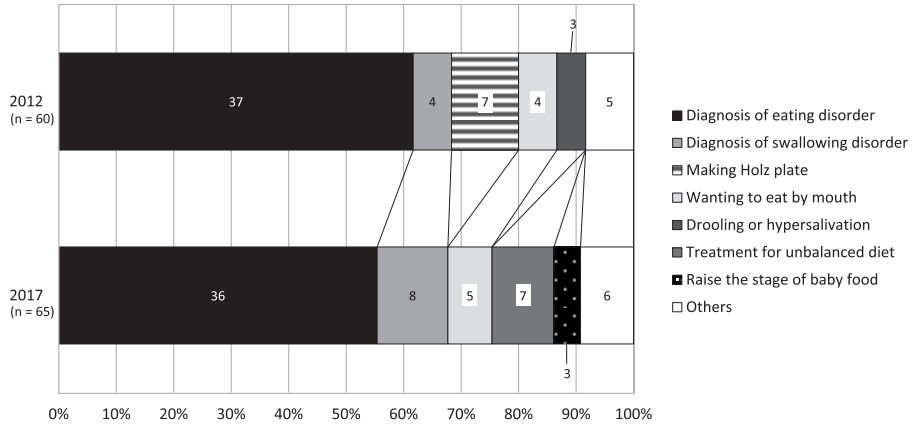


Fig. 5. Reason for visiting the Center of Special Needs Dentistry

Reasons for patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018.

*Primary disease*

As indicated in Table 1, cleft palate was the most common primary disease in 2012, and Down syndrome was the most common primary disease in 2017. Cerebral palsy was the second-most common primary disease in both 2012 and 2017, and normally developed children (those with primarily eating and swallowing problems) was the third. Types of diseases and syndromes have diversified as a result of the development of chromosomal examination in recent years. Normally developed children continued to represent approximately 10% of all new patients seen at the Center for eating and swallowing disorders.

Table 1. Primary diseases

| 2012 | | 2017 | |
|---|---|---|---|
| Disease name | N | Disease name | N |
| Cleft palate | 9 | Down syndrome | 7 |
| Cerebral palsy | 8 | Cerebral palsy | 6 |
| Normally-developed children* | 6 | Normally-developed children* | 5 |
| Intellectual disability | 6 | Intellectual disability | 3 |
| Down syndrome | 4 | Low birth weight infant | 3 |
| Pierre Robin syndrome | 3 | 22q11.2 deletion syndrome | 3 |
| Angelman syndrome | 2 | Cleft lip and palate/Cleft palate | 2 |
| Hypoxic encephalopathy | 2 | Trisomy 18 | 2 |
| Others | 20 | Rett syndrome | 2 |
| | | CHARGE syndrome | 2 |
| | | Laryngomalacia | 2 |
| | | Others | 28 |
| Total | 60 | Total | 65 |
| Types of diseases | 24 types | Types of diseases | 39 types |
| Types of syndrome | 7 types | Types of syndrome | 17 types |

Primary diseases in patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018. Only one primary disease is listed for each patient.
*Normally developed children (those with primarily eating and swallowing problems)

*Nutritional intake*

Only oral intake significantly increased from 2012 to 2017, while the number of patients with no oral intake reduced from 17% in 2012 to 10% in 2017 (Fig. 6).

*Eating and swallowing function*

The number of patients with severe swallowing dysfunction decreased from 2012 to 2017, but those with oral dysfunction increased. Moreover, the number of patients with coordination problems of the hand and mouth decreased, but those with problems related to preparing to eat or dietary behavior increased (Fig. 7).

## Discussion

The present study highlights the requirement for early intervention, response to life changes, and multi-disciplinary cooperation in the treatment of pediatric patients with eating and swallowing disorders. In addition, there is a need to respond to dietary problems in children, regardless of their disability status.

Early intervention is required with the problem of eating and swallowing. In 2012, many of the new patients were very young, and this result remained similar in 2017; this is a significant observation. It is often possible to improve occlusal and oral habits by early intervention[7,8], which also affects maxillofacial and body development and then eating and swallowing function[9,10].

In 2017, there were more visits from patients with Down syndrome than in 2012. This is

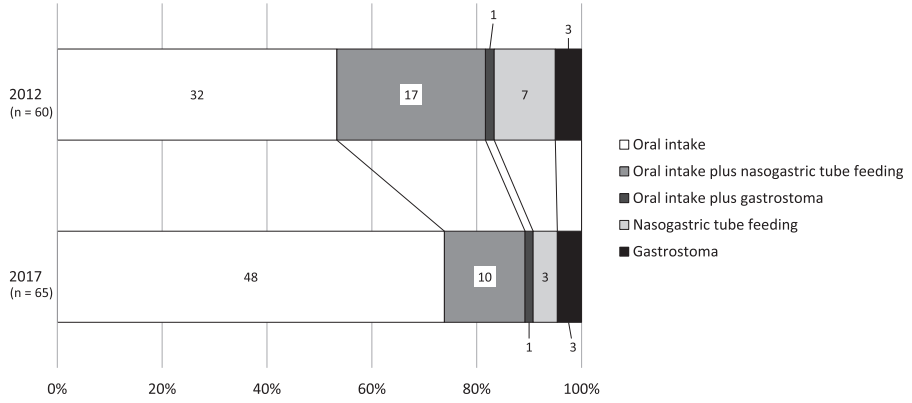


Fig. 6. Nutritional intake

Nutritional intake of patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018.

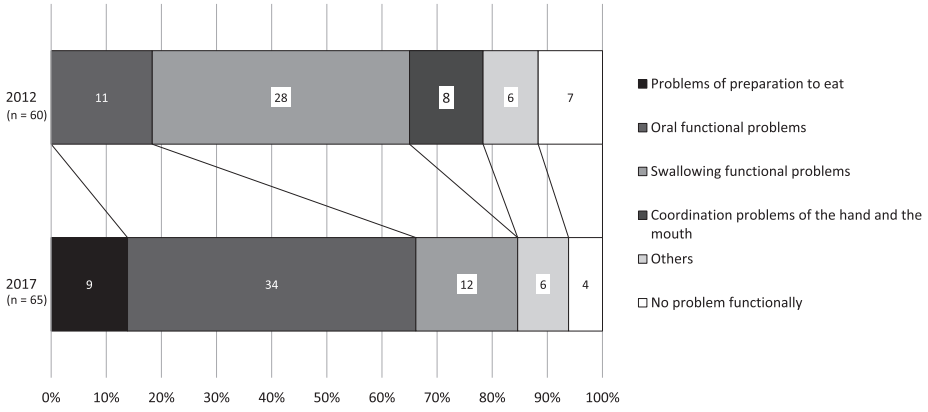


Fig. 7. Eating and swallowing function

Eating and swallowing function of patients ≤ 18 years of age visiting the Center of Special Needs Dentistry for the first time between April 2012 and March 2013, or between April 2017 and March 2018.

due to an increase in the percentage of pregnancies with advanced maternal age in Japan[11]. In addition, Down syndrome is widely known as a disease exhibiting eating and swallowing disorders. In Down syndrome, swallowing without chewing and the tongue thrust habit are often seen in infancy[3, 12]. It has also been highlighted that children with Down syndrome have a high likelihood of aspiration in infancy[13], and early intervention leads to a decreased risk of aspiration pneumonia. In many other diseases, early intervention leads to an improvement in the eating and swallowing function, promoting development[14, 15]. It is vital to continue to convey the importance of early intervention.

Problems with eating and swallowing are closely related to life changes, such as the eruption of teeth and starting school. There were many children visiting the Center from 0 to 4 years of age. The first 3 years of life is a period of dramatic change in primary dentition. Moreover, many children visited the Center from 6 to 7 years of age. Starting school is a time when the environment changes greatly from home to school, and the caregivers change from parents to

teachers. There were also many children visiting the Center after the age of 12, corresponding to the post-pubescent period. Eating and swallowing function can be affected by many factors, such as respiratory function, neural development, and motor function[3, 8, 16].

Eating and swallowing function can affect many aspects of children's lives, such as relationships with parents and other family members, and development[17–19]. It is presumed that an eating or swallowing problem may resurface following various changes, even if an improvement is seen temporarily.

In 2012 and 2017, there were many visits from the surrounding neighborhood (the Johnan area), suggesting that cooperation with a nearby school and treatment and rehabilitation centers (Ryouiku centers) has been successful. Since eating is a part of daily life, cooperation with many different types of services is necessary for the treatment of these problems.

Cooperation between doctors and dentists is also very important in the treatment of eating and swallowing disorders. Between 2012 and 2017, the number of patients with severe swallowing disorders decreased, while patients with oral dysfunction increased. There was also an increase in referrals from hospitals. In addition, the number of patients currently performing oral intake increased. Medical treatment is performed early in the case of severe swallowing disorders; however, it is considered to be a dentistry issue when a failure of oral function remains.

Dentistry has its limitations. This is because eating and swallowing disorders are also closely related to nutrition. For example, in some patients where it is not possible to supply sufficient nutrients by oral feeding, it becomes necessary to recommend a gastrostoma[18]. However, in contrast, dentistry provides much information on the use of oral instruments and oral habits[8, 9]. Currently, in Japan, there are many types of occupations engaged in the rehabilitation of eating and swallowing disorders; doctors and dentists, as well as nurses, pharmacists, speech therapists, physical therapists, dieticians, and dental hygienists, all use their expertise[20]. The dental treatment of eating and swallowing disorders requires specialization. It is essential to understand various diseases and to have a thorough knowledge of dental issues, such as occlusal abnormalities and oral habits. At the same time, knowledge and skills are required to understand and cooperate with the expertise of many professions.

There is also a need for eating and swallowing treatment in normally developed children. In 2017, as well as in 2012, many normally developed children with eating behavior problems visited the Center, suggesting that consultations with normally developed children are still required. There have also been reports that 53.8% of parents are worried about their children's diet, as stated in questionnaires intended for parents of preschool and kindergarten children. Moreover, their top worry was an unbalanced diet[21]. Thus, there exist many meal- and eating-related problems in children without the presence of disorders[22]. In the past, there was no medical insurance coverage for eating and swallowing treatment in normally developed children in Japan; however, in 2018, developmental insufficiency of oral function was listed. This has made it possible for an increased number of children without any disease to be treated for eating and swallowing disorders.

Treatment of eating and swallowing disorders is a field that started to attract attention in Japan in the 1990s. In Japan, with its super-aged society, there have been many reports describing eating and swallowing disorders of the elderly. Conversely, the number of statistical reports detailing eating and swallowing disorders in children is still small. By comparing the changes after five years, this study has shown the clear need for treatment of eating and swallowing disorders in children. The further development of treatment in this field is important.

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**Conflict of interest disclosure**

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**References**

1) Cabinet Office. Annual Report on Government Measures for Persons with Disabilities 2018. (accessed 2019 Apr 24) Available from: https://www8.cao.go.jp/shougai/whitepaper/h30hakusho/zenbun/pdf/ref2.pdf
2) Policy Planning Division, Department of Health and Welfare for Persons with Disabilities, Social Welfare and War Victims' Relief Bureau, Ministry of Health, Labour and Welfare. Heisei 28nen seikatsu no sidurasa nado ni kansuru chosa (zenkoku zaitaku shogaiji sha tou jittai chosa): kekka no gaiyo. 2018. (accessed 2019 Apr 24) Available from: https://www.mhlw.go.jp/toukei/list/dl/seikatsu_chousa_c_h28.pdf (in Japanese).
3) Field D, Garland M, Williams K. Correlates of specific childhood feeding problems. *J Paediatr Child Health*. 2003;**39**:299-304.
4) Ogawa A, Ishikawa T, Morita Y, *et al.* Clinical statistics for dysphagia patients ≤ 18 years of age in the center of special needs dentistry, April 2012-March 2013. *Showa Univ J Med Sci*. 2015;**27**:175-183.
5) Leopold NA, Kagel MC. Dysphagia: ingestion or deglutition?: a proposed paradigm. *Dysphagia*. 1997;**12**:202-206.
6) Yilmaz RB, Mutlu M, Germec-Cakan D. Clear double layer Bioplast feeding plate for neonates with cleft palate. *Eur J Dent*. 2015;**9**:610-613.
7) Boyd BA, Odom SL, Humphreys B, *et al.* Infants and toddlers with autism spectrum disorder: early identification and early intervention. *J Early Interv*. 2010;**32**:75-98.
8) Faulks D, Mazille MN, Collado V, *et al.* Masticatory dysfunction in persons with Down's syndrome. Part 2: management. *J Oral Rehabil.* 2008;**35**:863-869.
9) Wakabayashi K. Relationship between maxillofacial morphology and perioral muscle function. *Orthod Waves*. 2002;**61**:454-465.
10) Rensha H. How lip and tongue forces against incisors relate to craniofacial morphology in anterior open bite patients with a tongue thrust habit. *J Osaka Dent Univ*. 2003;**37**:83-89.
11) Cabinet Office. A 2018 declining birthrate white paper. (accessed 2019 Jul 23) Available from: https://www8.cao.go.jp/shoushi/shoushika/whitepaper/measures/english/w-2018/index.html
12) Gisel EG, Lange LJ, Niman CW. Tongue movements in 4- and 5-year-old Down's Syndrome children during eating: a comparison with normal children. *Am J Occup Ther*. 1984;**38**:660-665.
13) Jackson A, Maybee J, Moran MK, *et al.* Clinical characteristics of dysphagia in children with Down syndrome. *Dysphagia*. 2016;**31**:663-671.
14) Turner L, Jacobsen C, Humenczuk M, *et al.* The effects of lactation education and a prosthetic obturator appliance on feeding efficiency in infants with cleft lip and palate. *Cleft Palate Craniofac J*. 2001;**38**:519-524.

15) Fucile S, Gisel E, Lau C. Oral stimulation accelerates the transition from tube to oral feeding in preterm infants. *J Pediatr*. 2002;**141**:230–236.
16) Dobbelsteyn C, Marche DM, Blake K, *et al*. Early oral sensory experiences and feeding development in children with CHARGE syndrome: a report of five cases. *Dysphagia*. 2005;**20**:89–100.
17) Kibayashi M, Ohash K, Morishita M, *et al*. Correlation of the ability of mastication in the preschool children with their dietary and living behaviors. *J Dent Hlth*. 2004;**54**:550–557. (in Japanese).
18) Rogers B. Feeding method and health outcomes of children with cerebral palsy. *J Pediatr*. 2004;**145**(**2 Suppl**):S28–S32.
19) Reilly S, Skuse D, Poblete X. Prevalence of feeding problems and oral motor dysfunction in children with cerebral palsy: a community survey. *J Pediatr*. 1996;**129**:877–882.
20) Oguchi K, Saitoh E. A historical review of medical treatment for dysphagia. *Jpn J Natl Med Serv*. 2007;**61**:83–85. (in Japanese).
21) Tamura F, Kimoto S, Yamasaki Y. Parental response to child eating problems. *Jpn J Ped Dent*. 2017;**55**:18–28. (in Japanese).
22) Ministry of Health, Labour and Welfare. Nyuyoji eiyo chosa. 2015. (accessed 2019 Apr 24) Available from: https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000134208.html (in Japanese).

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